FIG. 1

FIG. 2

START

201 — GENERALIZE QUERIES AND GENERALIZE E_n CANDIDATE TEMPLATES

202 — ESTIMATE PROFIT METRIC FOR QUERY TEMPLATES

203 — RECEIVE NEW QUERY

204 — GENERALIZE NEW QUERY WITH CANDIDATE TEMPLATE AND UPDATE BENEFITS OF TEMPLATES THAT CAN BE USED TO ANSWER NEW QUERY

205 — AGE UNTOUCHED CANDIDATE TEMPLATES

206 — RETAIN TEMPLATE WITH HIGHEST BENEFIT AND $n-1$ ADDITIONAL TEMPLATES WITH LAGEST PROFIT VALUES
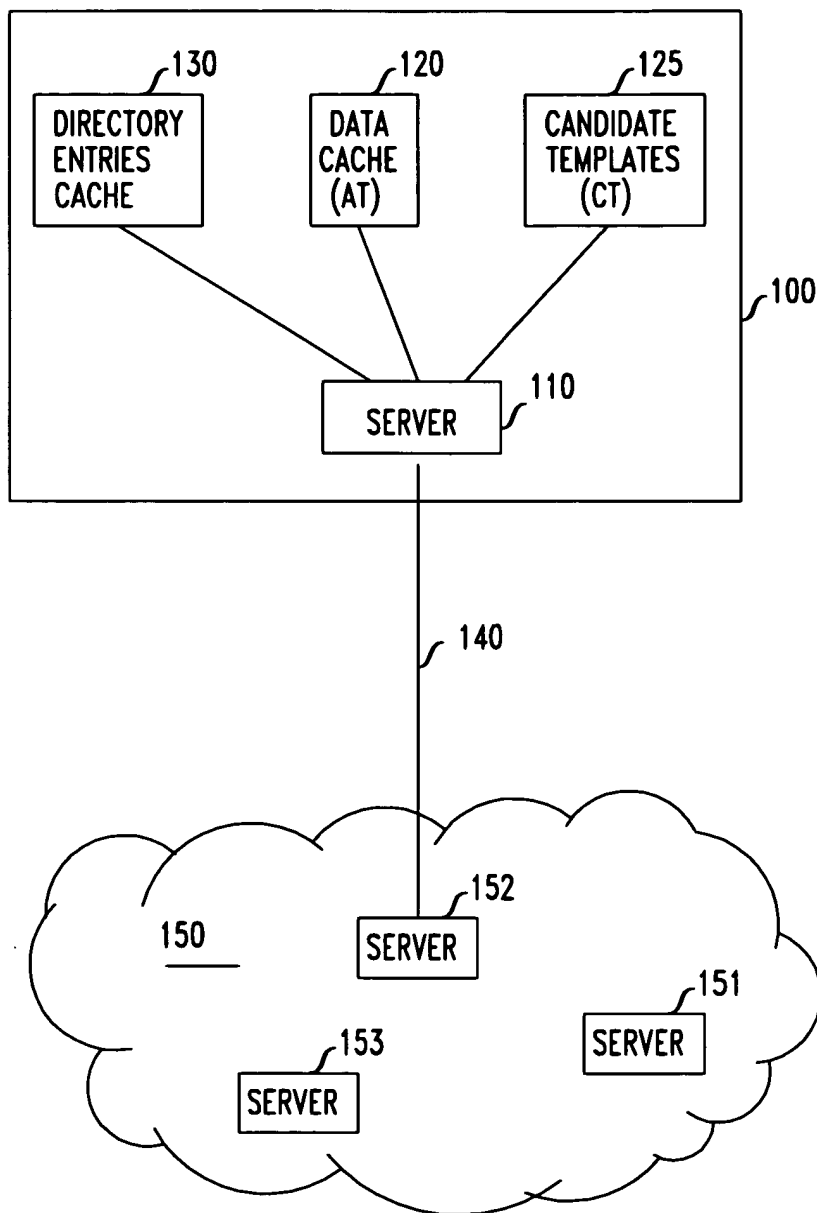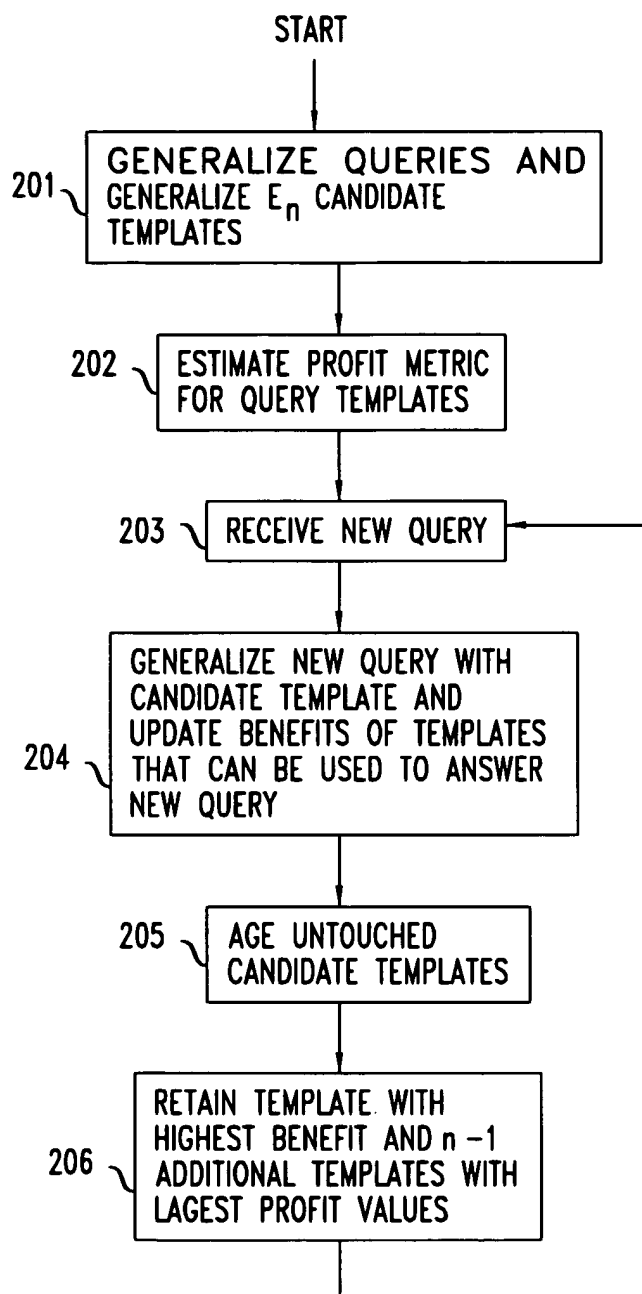
FIG. 3

```
ChooseCandidate (q,CT)
    /* CT={ ct_i, ...,ct_n} */
    NT=0
    FOR EACH ct  in CT_i
        nt =CompPairTemplate (ct ,q)
        IF (nt_i =ct_i)
            /* q: SPECIALIZATION OF ct_i */
            b(ct_i )=b(ct_i )+c(q)
        ELSE IF (nt_i ∈ NT)
            /* nt_i: TEMPLATE EXISTS */
            b(nt_i )=max(b(nt_i ), b(ct_i )+c(q))
        ELSE IF (s(nt_i) < S)
            b(nt_i )=b(ct_i )+c(q)

            ADD nt_i TO NT

    /* AGE EACH UNTOUCHED ct_i */
    NT=NT U CT
    IF (q ⊄ NT and s(q) < S)
        b(q)=c(q)
        NT=NT U q
            TEMPLATES WITH HIGHEST
    CT= {BENEFIT IN NT }
    CHOOSE (n-1) ADDITIONAL
        TEMPLATES WITH LARGEST VALUES
        OF PROFIT PROFIT p(t) IN NT
    RETURN CT

}
```
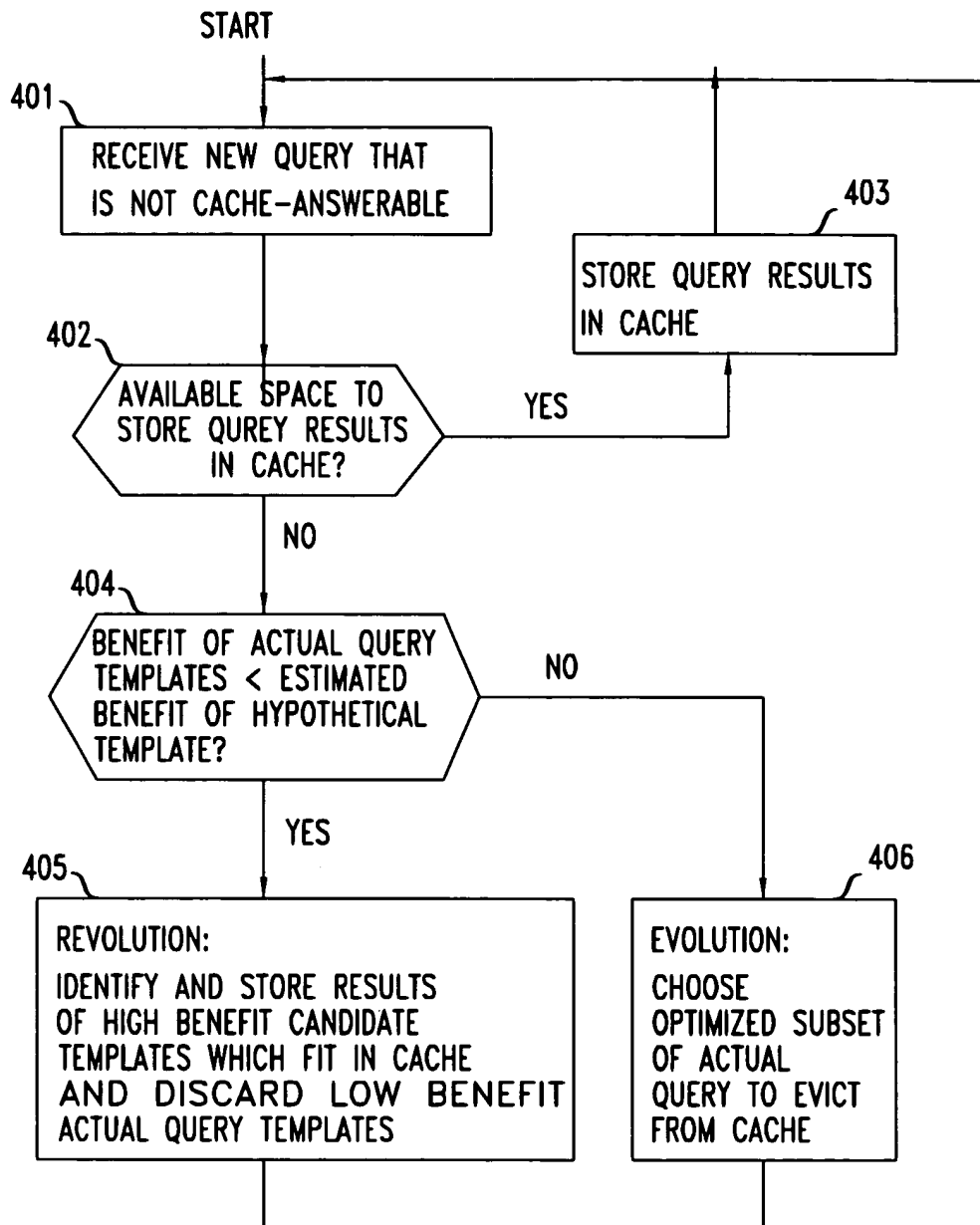
FIG. 4

START

401 — RECEIVE NEW QUERY THAT IS NOT CACHE-ANSWERABLE

403 — STORE QUERY RESULTS IN CACHE

402 — AVAILABLE SPACE TO STORE QUREY RESULTS IN CACHE?

YES

NO

404 — BENEFIT OF ACTUAL QUERY TEMPLATES < ESTIMATED BENEFIT OF HYPOTHETICAL TEMPLATE?

NO

YES

405 — REVOLUTION:

IDENTIFY AND STORE RESULTS OF HIGH BENEFIT CANDIDATE TEMPLATES WHICH FIT IN CACHE AND DISCARD LOW BENEFIT ACTUAL QUERY TEMPLATES

406 — EVOLUTION:

CHOOSE OPTIMIZED SUBSET OF ACTUAL QUERY TO EVICT FROM CACHE

FIG. 5

```
Revolution (AT,CT) {
    /* COMPUTE CT' AT U CT FOR ADMISSION */
    SORT THE t_i 's USING
```

$$p(t_i) = \frac{b(t_i) - a(t_i)}{s(t_i)}$$

```
    CT'=0
    REPEAT
        ADD THE HIGHEST RANKED
            REMAINING t_i THAT CAN
            FIT IN THE AVAILABLE
            CACHE SPACE TO CT'
        ADJUST FREE SPACE TO REFLECT s(t_i)
        ADJUST BENEFITS, COSTS,
            SIZES OF UNSELECTED
            TEMPLATES IN CT U AT
        RE-SORT
    UNTIL (NO MORE TEMPLATES CAN BE ADDED)
    CT"=TEMPLATE t_i in CT U AT
        WITH HIGHEST VALUE OF b(t) - c(t)

    IF (b(CT") >=b(CT'))
        RETRUN CT"
    ELSE RETURN CT'
}
```